

Title: *Coronal Heating Time Dependence*

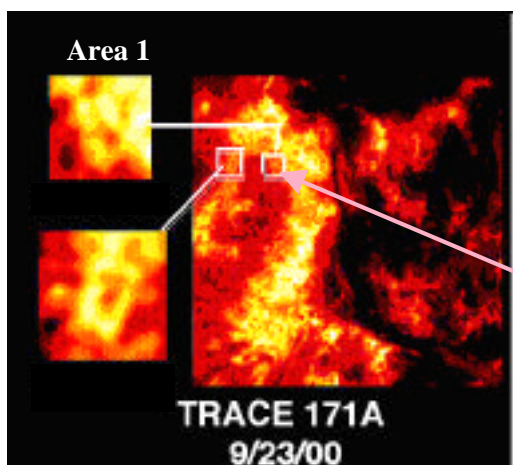
Cluster: *Cross-Theme Theory and Data Analysis/SECTP*

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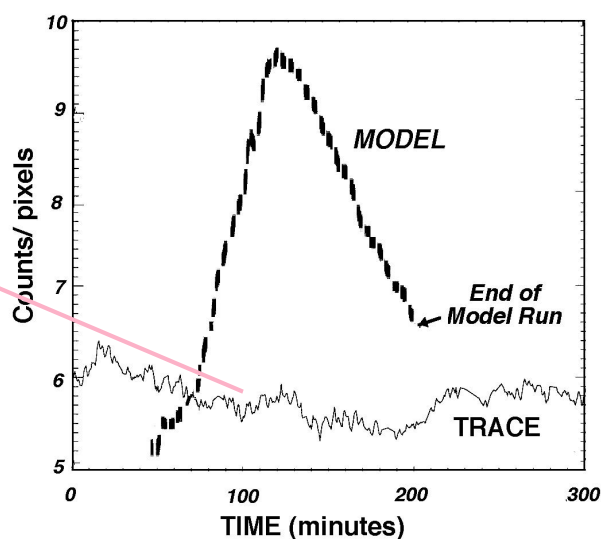
• **Coronal Heating is NOT Impulsive.**

The mechanism for heating the Sun's corona has been one of the most intensely studied problems in solar physics during the past fifty years, and yet it remains one of the least understood. The main obstacle is that the coronal magnetic field, which is widely believed to be responsible for the heating, cannot be observed directly. The action of the field can only be inferred by observing its effects on the plasma in combination with theoretical modeling. NRL's new adaptive-mesh refinement simulations of coronal loop plasma (a model developed under support of the Sun-Earth Connection Theory Program), in combination with the ultra-high spatial and temporal resolution observations from the Transition Region and Coronal Explorer (TRACE), has recently demonstrated that coronal heating must be fairly steady on time scales of hours. The heating is not flare-like, contrary to most popular models. A numerical simulation of a coronal loop with impulsive heating produced an emission enhancement of $\sim 70\%$, substantially larger than observed by TRACE.

This is an important step forward in understanding the Sun's activity and is another example of the close relationships of SECTP research efforts and NASA's spacecraft missions.



EUV image from TRACE in a large active region.



Pixel count in TRACE image Area 1 compared to TRACE intensity prediction of an impulsive coronal loop heating model.

REFERENCE: "Constraints on Active Region Coronal Heating", S. K. Antiochos, J. T. Karpen, E. E. DeLuca, L. Golub, and P. Hamilton, *Astrophys. J.*, submitted, 2002.